FURTHER NOTES ON HISTORICAL BALD EAGLE AND PEREGRINE FALCON POPULATIONS ON THE CALIFORNIA CHANNEL ISLANDS

Lloyd F. Kiff
1198 Clear Creek
Boise, ID 83709 USA
lkiff@aol.com

31 March 2000

38pp

FURTHER NOTES ON HISTORICAL BALD EAGLE AND PEREGRINE FALCON POPULATIONS ON THE CALIFORNIA CHANNEL ISLANDS

Lloyd F. Kiff

31 March 2000

Abstract: Historical (pre-1960) records of former Bald Eagle *(Haliaeetus leucocephalus)* and Peregrine Falcon *(Falco peregrinus)* populations on the California Channel Islands summarized in an earlier paper (Kiff 1980) were reassessed and supplemented with additional information obtained from the published literature; data associated with museum specimens; field notes, journals, and correspondence of collectors; and interviews with visitors to the island.

Based on these sources, the maximum numbers of nesting Bald Eagles reported per island in a single year were Anacapa (3), San Clemente (3), San Miguel (3), San Nicolas, Santa Barbara (1), Santa Catalina (4), Santa Cruz (5), and Santa Rosa (3). Over the entire period from 1875 to 1960, active Bald Eagle nests were reported from a minimum of 35 different sites on the Channel Islands. These totals do not differ from those I reported earlier (Kiff 1980), although more supporting data was found to justify them.

For the two smallest islands (Anacapa and Santa Barbara), the totals given here probably represent the actual maximum number of pairs ever nesting in a single year. The number of resident breeding pairs of eagles on the other islands was almost certainly much higher, since there was never any systematic attempt made to locate all nesting eagles on any of the larger islands in a single year, and many large areas with suitable nesting habitat were seldom, if ever, visited by collectors.

While it is not possible to determine the exact year of extinction of Bald Eagles on each island, there is good evidence that the species nested on Santa Catalina, Anacapa, Santa Cruz, and Santa Rosa Islands until at least the 1950s, and probably on San Nicolas Island as well. There is a lack of ornithological information for San Clemente after 1939; thus, no conclusion can be drawn about the time of the extirpation of the former eagle population there. There were no eagles on tiny Santa Barbara Island when it was visited by two different biological survey parties in 1939, but as the island probably only supported one pair of eagles, intermittent nesting there may have been the norm.

Being less conspicuous than the eagles and of less interest to egg collectors (who could obtain sets (egg clutches) more easily from mainland localities), Channel Island peregrine populations were less well documented, and I was unable to find significant additional information not already reported in my 1980 paper. There it was shown that on the few islands where observational data are available, peregrines survived into the 1950s. A total of 15-16 different nesting territories active at some point in history was documented, but in the absence of

simultaneous, systematic surveys, this figure cannot be considered equal to the actual historical population size.

Although the eagles (if not the peregrines) suffered various forms of persecution, mostly shooting and poisoning, from residents on certain islands, such practices did not occur simultaneously on all islands, presumably affected only the birds resident on particular islands, and did not occur frequently, if at all, on some of the larger ones. Egg collecting occurred mostly on Anacapa and Santa Cruz Islands (accounting for 56 (61%) of the 92 sets documented here) and was limited mainly to two periods, 1916-1920 and the mid-1930s, yet eagles continued to nest regularly on these islands after collecting ceased.

The complete loss of these species from the Channel Islands for more than two decades requires a more general explanation. The timing of the extinctions coincided closely with the loss of peregrines and Bald Eagles from other portions of their North American range as a result of the eggshell-thinning effects of DDE, and the continuing influence of this contaminant could also account for the inability of these raptors to recolonize the islands after other forms of anthropogenic mortality had ceased. The lack of breeding peregrines on the southernmost islands, the lack of nesting Bald Eagles on the northern Channel Islands, and the failure of Santa Catalina Island eagles to breed successfully cannot be explained by traditional sources of mortality, but seem more likely to be the result of the lingering effects of high DDE levels in Channel Islands ecosystems.

Introduction

In 1980 I published a history of three raptor species, Osprey *(Pandion haliaeetus)*, Bald Eagle *(Haliaeetus leucocephalus)*, and Peregrine Falcon *(Falco peregrinus)*, which had been extirpated as breeding residents on the Channel Islands, off California, and the Los Coronados Islands, off Baja California Norte, Mexico (Kiff 1980). From the available historical evidence, I concluded that Ospreys had disappeared from the southern islands as a breeding species by the about 1930, but that the peregrine and the eagle were not extirpated until the early and late 1950s, respectively.

The islands discussed here include a northern group, consisting of San Miguel, Santa Rosa, Santa Cruz, and Anacapa, and the more southern and disjunct islands of Santa Catalina, Santa Barbara, San Clemente, and San Nicolas. The Los Coronados are not treated here.

This report provides additional data on Channel Islands populations of the Bald Eagle and the Peregrine Falcon that have come to my attention since the 1980 paper. In addition, most of the records reported in my 1980 paper are also included here in order to present as complete a history as possible in a single source. My principal objective was to determine more specifically the timing of the extirpation of the eagles and the peregrines from the Channel Islands. In addition, I have included detailed specimen data not presented in my earlier publication in order to provide more information on the historical numbers and local distribution of these birds of prey on the islands. Thus, some mention is made of virtually all published accounts of these species on the Channel Islands up to the probable time of their extirpation.

My data sources for this report were of the same types as those consulted for the 1980 paper, including published accounts, both in the scientific and popular literature, the data associated with museum specimens, the journals, field notes, and correspondence of collectors, ornithologists, and other visitors to the islands, and interviews with island residents and visitors.

Results

Bald Eagle:

Willett (1912) and Howell (1917) regarded the Bald Eagle as a common resident of the Channel Islands. Although he regarded eagles as still fairly common on the islands, Dawson (1923) noted that the population had been greatly reduced by human persecution, and he predicted, "Unless the Bald Eagle is actually protected, not alone from lawless marauders in motor boats, but from the vengeance of sheepmen...its days are numbered." Similarly, Willett (1933) revised his earlier assessment of the species' status on the islands to "fairly common." Still, Grinnell and Miller (1944) stated that the remaining "breeding metropolises" of this species in California were the "Santa Barbara Islands" (= Channel Islands) and the lake region of northeastern California, and they stated that Bald Eagles nested on all of the Channel Islands.

The following island-by-island history of Bald Eagles on the Channel Islands is based in large part on the findings of egg collectors. Specific collection data for each of the egg sets that have come to my attention are given in Table 1.

Anacapa: The earliest report of Bald Eagles on Anacapa Island was that of Grinnell (1908), who saw one there on 4 September 1903.

Willett (1910, 1912) and three other southern California ornithologists "found several nests of the Bald Eagle and Duck Hawk [= Peregrine Falcon] containing nearly full grown young " on Anacapa Island on 5 June 1910. Unfortunately, the number of eagle nests observed cannot be ascertained from this statement.

Burt (1911) stated that there were several resident pairs of Bald Eagles on Anacapa Island. He and Sidney Peyton collected a set of two eggs on 15 March 1911 from a nest on the south side of the West Island, and a second nest on the south side of the East Island was found to contain two downy young of 2-3 days of age on 17 March. A third nest with a bird sitting on it was found on another cliff ledge on 19 March, probably on the portion of the island between the other two, but its contents were not examined. A point of interest is that all of the nests on Anacapa Island were built of sticks, which the collectors (e.g., Burt 1911) thought had been carried from nearby Santa Cruz Island, since there were so few large trees on Anacapa.

In addition to their many egg set records reported in Table 1, the Peyton brothers, Sidney and Lawrence, and four other persons visited an eagle nest on West Anacapa Island on 11 May 1912 and photographed a young eagle in the nest (Peyton 1913).

In an unpublished manuscript (WFVZ archives) on the birds of Ventura County, Martin C. Badger provided a detailed account of an egg collecting expedition that he and the Peyton brothers made to Anacapa and Santa Cruz Islands in early March 1917. On 2 March they landed on the east end of the island where the pelican colony was located. The Peyton brothers took two Bald Eagle eggs from a nest about 1/4 mi from the pelican colony. They went to the other end of the island where another pair of eagles had a nest. Badger commented that the boat captain, Bay Webster, had leased the island and had a large flock of sheep grazing there. He was very supportive of the egg collecting efforts because he told Badger that the eagles ate lambs in the springtime.

The eagle nest on the west end of the island was placed on a pinnacle of rocks 140 ft below the top of the ridge and 200 ft above the ocean. Badger and Sidney Peyton roped into the nest, which was said to be 9 ft high by 5 ft wide at the top. It contained two eggs which later proved to be infertile. Captain Webster told the collectors that the nest had been active when he was a boy (estimated by Badger to be 40 years earlier). This account implies that there were only two pairs of eagles nesting on the island at this time.

Dudley R. DeGroot (notes) visited Anacapa Island on 28 March 1927 with several companions and saw several eagles in the air at one time. They examined three nests, all unoccupied, including one on the north end of the island on the landward side (= "East Island"), one on a small "sugarloaf" between the West and East Islands, and one on the long hogback of the South, or West, Island. They found tracks of three persons around the latter nest and concluded, rightly, that it had been visited earlier by egg collectors. Indeed, a set of eggs had been collected from that nest on 13 March by Martin C. Badger and the Peyton brothers.

Ashworth and Thompson (1930) took two sets of two eagle eggs and one set of three on 9 March 1930, and Sidney Peyton (1931) listed sets of one, two, and three eggs, respectively, that he collected on 8 March 1931, probably on both Anacapa and Santa Cruz Islands.

Sumner (ms) stated that on 16 April 1939 this species was "almost constantly in sight on Anacapa, two adults and four immature having been seen over the highest peak at once."

According to Harold Hill's field notes (pers. comm.), he and Telford Work found two adult eagles and a young bird of the year on the wing on Anacapa on 23 June 1946. The nest that had been used that year was located in a tree. He reported at a meeting of the Northern Division of the Cooper Ornithological Society on 27 June 1946 that the breeding pair was feeding on fish and seabirds, including Brown Pelicans (Ramage 1946). A large Brown Pelican colony on the island was said to be within sight of the nest.

Raymond J. Quigley (pers. comm.) visited the traditional West Island nest site (the one said to have been active since the 1800s and probably the same one seen in 1946 by Hill) on 24 May 1949 with Telford Work and Harold Hill and found that the nest contained one chick, which he photographed. A photo of the chick is shown in Kiff (1980). Interviewed recently (1999), and separately, both Quigley and Hill recollected that a man living on the island told them that there was another active Bald Eagle nest site on Anacapa at that time, but they did not have time to visit it. J.H. Comby also reported a Bald Eagle on Anacapa on 20 April 1949 (*fide*

Stager 1949).

The most recent Bald Eagle nesting record that has come to my attention was the report by Green (1966) that a boat party of 37 people went from Port Hueneme to the waters around Anacapa and Santa Cruz Island on 9 March 1952 and saw two adult Bald Eagles on Anacapa, " one of which sailed off its nest which was in a small tree on the side of Anacapa."

Raymond Quigley and several companions visited Anacapa Island, where they collected several sets of Brown Pelicans eggs, on 27 May 1962, but they found no eagles on the island. A Los Angeles Audubon Society group also went to the island on 13 May 1962, but failed to find Bald Eagles there (*fide* A. Small 1962).

Banks (1966) knew of no recent records of this species from Anacapa Island, and he stated that "the reason for this can be little but conjecture."

In summary, the Bald Eagle disappeared as a breeding species on Anacapa sometime between 1952 and 1962.

San Clemente: San Clemente Island was visited fairly frequently by bird and egg collectors between 1897 to 1923, and several Bald Eagle egg sets and birds were collected. I have not found any information from collectors or others who visited this island between 1939 and the 1960s, so a critical period of the history of Bald Eagles there is undocumented.

Cooper (1870a) included the Bald Eagle on his list of San Clemente Island bird species, but he did not report the seasonal timing of his visit, which must have been in the early 1860s. In the company of the collector A.W. Anthony, Edgar Mearns (notes) saw young Bald Eagles on San Clemente Island during a visit between 22-23 August 1894.

Grinnell (1897) visited San Clemente Island 28 March-3 April and 28 May-7 June 1897, and he stated that "The Bald Eagle was seen rather commonly along the shores of the island, but as usual, quite shy." He thought that the birds ate mainly dead fish cast upon the shores of the island, rather than pirating food from the large resident population of Ospreys. Grinnell found a Bald Eagle nest on a shelf of rocks on a steep hillside west of Smuggler's Cove on 1 April, and he collected the single egg that it contained. During his second visit he saw several immature eagles, probably indicating that a sizeable breeding population was then resident on the island.

Breninger (1904) provided a colorful (but almost certainly inaccurate) account of his adventures with San Clemente Island Bald Eagles that involved a description of a male eagle attacking him and his small dog repeatedly at a nest, a very unlikely occurrence, based on the timidity of this species near nests elsewhere throughout its range. Breninger mentioned seeing eagle nests on the ledges or holes in seawalls on the north end of the island, and another nest, from which he collected two eggs, was on a large rock located a full mile from the end of the island.

Linton (1908) stated that he visited "several active nests" (presumably implying three or

more) during January-April and October 1907, and he collected two sets of eggs. The nests were located on cliffs in larger canyons, one-fourth to one mile from the coast, whereas those from which Breninger collected eggs in 1903 were on a rocky ledges overlooking the sea and on a large offshore rock, respectively. Linton stated that there were numerous skeletal remains of sheep and young lambs at the bottom of the nest cliffs.

A.B. Howell, Laurence M. Huey, and Donald R. Dickey visited San Clemente Island in the spring of 1915, and they found Bald Eagles to be numerous. They collected a set of two eggs from a nest on 4 April. The nest from which the eggs were taken had an entire island fox incorporated into the structure.

On 13 April 1920, Joseph Dixon (notes) observed several Bald Eagles feeding on freshly killed sheep near the Eagle Ranch (said to be 5 mi from Wilson Cove) on San Clemente Island. It is not clear from his notes whether he thought the eagles had killed the sheep.

The Griffing Bancrofts, Jr. and Sr., took three sets of Bald Eagle eggs on one trip to San Clemente Island in 1923, indicating that at least that many pairs nested on the island at that time. They also visited the island during the previous year.

D.R. DeGroot (notes) saw four eagles in the air at the same time on 26 March 1927 and examined a newly lined, but empty, nest on the top of the southeast end of San Clemente Island.

According to Jones and Collins (ms), George Willett noted adult and immature eagles occasionally between 8 November and 10 December 1939.

Most collector visits were too brief to have permitted coverage of the entire island; thus, it seems reasonable to assume that San Clemente Island supported more than three pairs of nesting eagles historically. All reported Bald Eagle nests from San Clemente were on rocky cliffs, probably reflecting the relative scarcity of suitable large trees on the island. Several collectors, including Donald R. Dickey and Griffing Bancroft, Sr. reported finding the bodies of sheep and island foxes in the nests, but probably as construction materials, rather than as food. However, the species was probably persecuted by the sheepherders on the island.

The lack of ornithologist visits to San Clemente Island after 1939 makes it impossible to speculate on the date of extirpation of Bald Eagles on the island.

San Miguel: Streator (1888) recorded Bald Eagles on San Miguel Island in July 1886, and Willett (1910) found them to be common there in June 1910.

A Bald Eagle egg set in the British Museum was collected on San Miguel on 8 March 1920 by Sidney Peyton and was obtained by the museum in 1958 as a part of the collection of Dr. D. Moore Lindsay, a British oologist and physician who lived for many years in Utah.

Pemberton (1928) reported that a party of ornithologists visiting San Miguel Island between 31 March-2 April saw 10 Bald Eagles there and found three nests, two of which

contained small young. Two eggs were collected from the third nest on 1 April, and a photo of the site appeared in Pemberton (1928). Dudley DeGroot (notes), who was among the party, wrote that they saw three adult eagles on San Miguel Island on 31 March 1927 and that two inactive nests were seen on the top of the northwest end of the island. The Pemberton set was taken from a nest on the southwest end of the island.

A.J. van Rossem (notes) collected passerines on San Miguel Island at the end of 1930, and he wrote on 28 December that the resident caretaker had poisoned or shot 20 or more eagles in the past year. van Rossem actually saw the wings of these birds nailed to the barn there. Despite this apparently high level of mortality, van Rossem said that the "usual number" of live eagles seemed to be inhabiting the island at that time, and he speculated that birds must be constantly immigrating to San Miguel Island from other areas. Perhaps many of them were wintering individuals.

Jones and Collins (ms) confirmed that the caretaker in 1927, a "Mr. Brooks," thought that the eagles killed lambs, and that "he wished he could kill all the eagles." However, his successor, Herbert Lester, did not share this opinion of the eagles, and he told Sumner and Bond (ms) that he protected the eagles as actively as he could. Although he had frequently observed eagles eating dead sheep, it was his opinion that they did not actually kill sheep or lambs. Thus, persecution of the eagles by shooting and poisoning may not have occurred on this island after the 1930s. Indeed, Peter Howorth (pers. comm.) told me that Lester's wife, Elizabeth, actually had pet names for the individual eagles living near their home on San Miguel, hardly the behavior of persons bent on destroying the birds!

Sumner and Bond (ms) described a Bald Eagle on Prince Island, just off San Miguel, on 18 April 1939, and this was apparently the latest written account of the species nesting in the area. Sumner and Bond (op cit.) also stated that there were at least two additional nesting pairs, according to Lester.

When I circled San Miguel Island slowly in a boat with Peter Howorth in the spring of 1980 in a futile search for Peregrine Falcon nests, he pointed out the remains of at two Bald Eagles nests from former years located in rocky sea cliffs near Judith Rock and Tyler Bight, respectively. These sites were also mentioned by Jones and Collins (ms), who stated that the old nest structures still existed in the early 1980s. R.L. Pitman (*in litt.*, 15 August 1979) informed me that he and Paul Kelly found four old Bald Eagle nests on Castle Rock, off San Miguel Island, on 2 August 1979, and he also mentioned a photograph of an old Bald Eagle nest on Prince Island in the files of the National Park Service.

Interestingly, Pemberton (1928) suggested that the strong winds on this island prevented the eagles from building their nests on cliffs and pinnacles as they did on other islands, and all of the nests found by his party in 1927 were in trees away from the shore, and these would have represented still additional sites. Given the large resident populations of seabirds and pinnipeds, San Miguel Island must have provided unusually good living conditions for Bald Eagles historically, and it is not unrealistic to suspect that as many as four to six pairs, plus another one on adjacent Prince Island, were resident there.

San Nicolas: Relatively few ornithologists or collectors visited San Nicolas Island historically, so the size of the Bald Eagle population there is poorly known. There is no question, however, that the species was formerly resident there. Streator (1888) encountered Bald Eagles on San Nicolas Island in mid-autumn 1886, and Grinnell (1897) saw them on several occasions along the southeast side of the island between 19-26 May 1897.

Willett (1912, 1933) mentioned that C.B. Linton collected Bald Eagle egg sets on San Nicolas Island, and this is presumably the 1909 nesting record mentioned by Jones and Collins (ms). Howell (1917) also mentioned Linton's assertion that eagles were abundant on San Nicolas.

Bent (1937) reported visiting San Nicolas Island with J.R. Pemberton on about 24 Feb. 1929 and seeing an old Bald Eagle nest there, but he did not mention seeing the actual birds. Similarly, Loye Miller (ms) did not encounter eagles on San Nicolas during his visit there between 7-18 July 1938.

The U.S. Navy allowed Egmont Rett, the curator of birds at the Santa Barbara Museum of Natural History, to conduct field work on San Nicolas Island from 7-19 March and 26 March-12 April 1945, and another 9-day visit to the island was made in September of the same year. He encountered an adult Bald Eagle on 14 March and also examined a nest on 23 September (Rett 1947). A resident of the island told him that the nest had been used in the previous summer. It was located on an overhanging ledge above a deep canyon on the south side of the island. (Rett op cit.). It seems likely that eagles must have been present in low numbers during Rett's presence on the island, or he would have seen more of them.

George Bartholomew, a UCLA biologist, saw an immature Bald Eagle on San Nicolas Island in June 1949 (Jones and Collins ms.). Depending on its age, the date suggests that the bird could have been fledged from a nest on the island.

Nicholas Collias conducted field work on San Nicolas Island between 9-13 January 1959, but did not find any eagles. A detailed survey of the birds of San Nicolas Island was conducted by Townsend (1968) between 2 May 1962 and 21 January 1964, and he did not record any Bald Eagles. Thus, the extirpation of the species from this island occurred sometime between Bartholomew's 1949 sighting of an immature and 1962.

Santa Barbara: Cooper (1870a) visited this small island for six weeks in May and June 1860(?), and he included the Bald Eagle in his list of birds of the island without comment. Given the season, however, it is likely he saw nesting birds, rather than migrants.

Grinnell (1897) saw single (?) Bald Eagles flying above Santa Barbara Island on two occasions between 13-18 May 1897.

Two sets of eggs in the Field Museum of Natural History purportedly taken by C.K. Knickerbocker on Santa Barbara Island on 4 and 6 April 1906, respectively, may have actually been collected on one or more other islands. The museum apparently no longer has the original

data slips. It was a common practice in the early part of the century to refer to the Channel Islands as the "Santa Barbara Islands," and a museum technician may have made such an entry, losing the identity of the actual collecting site in the process. It seems unlikely, although not impossible, that two pairs of Bald Eagles would have been nesting on tiny Santa Barbara Island at the same time.

Another early visit to the island was that of Wright and Snyder (1913) who saw an " unafraid" adult Bald Eagle and a fully grown juvenile on the northwestern part of the island on 2 July 1912. Howell (1917) mentioned that he had seen eagles around Santa Barbara Island, as had others, but he thought that there was only a single resident pair.

L. Sumner and R. Bond (ms) did not encounter Bald Eagles on Santa Barbara Island in April 1939, and the species was not recorded by a biological survey party from the Los Angeles County Museum of Natural History between 27-30 May 1939 (J.C. von Bloeker, Jr. *in litt.*). The island is so small that eagles, had they been present, could not have been missed by these observers.

According to Jones and Collins (ms), a Bald Eagle (age not stated) was collected on this island on 11 September 1957 and is now in the collection of the Museum of Vertebrate Zoology, University of California, Berkeley (MVZ 136,146). The fall date suggests that it could have been a migrant.

Jones and Diamond (1976) and Jones and Collins (ms) stated that the species also nested on Santa Barbara Island in 1911, but I have not been able to locate the source of this record.

Santa Catalina: Cooper (1870a, 1870b) found this species to be common on Santa Catalina Island during his visits there in June, July, and late October in the 1860s. He stated that "I have seen more than thirty of these eagles in young plumage, soaring about the north end of Catalina Island on the 9th of July, and their nests were numerous among the inaccessible cliffs of that island. They seem, however, to prefer to build in trees, where there are any large ones, and continue to build one nest above another year after year, until the pile becomes large enough to fill a wagon."

Zahn (1895) stated that he had noticed three Bald Eagle nests on Santa Catalina island during a visit in 1894, but had collected no eggs from them.

Grinnell (1898) found eagles "common along the precipitous margins of the island" between 24-31 Dec. 1897.

When Willett collected a set of two eggs from a nest on an ocean cliff, partially supported by a small tree, on Santa Catalina on 3 March 1905, he noted on the data slip that there were two other nests nearby, one of which had been used in 1904 (indicating that he probably visited the island then, too). The 1905 nest was located 70 feet above the ocean. Willett took another set of two eggs on the island on 9 March 1905.

Richardson (1908) saw "A number of bald eagles...circling about the cliffs" when he

visited Santa Catalina Island in April 1905 and 1906.

Between 7-11 April 1909 Snyder (1909) inspected several Bald Eagle nests on Santa Catalina, but the contents were not noted.

Howell (1917) mentioned that the killing of Bald Eagles on Santa Catalina by tourists and sheepherders had reduced their population to some extent, but that several individuals could still be seen at almost any time and that many of their nests could be seen on the cliffs and in wind- blown trees at the edge of cliffs.

A.J. van Rossem (notes) visited Santa Catalina Island frequently during the early 1920s, and a synopsis of his Bald Eagle observations follows:

15 Jan. 1920: Saw a pair between Avalon and Camp Banning.
20 Jan. 1920: Saw three adults at an unspecified locality.
24 Jan. 1920: Saw another pair on a cliff between Camp Banning and "White's," near an old nest.
29 Jan. 1920: Saw last year's immature on beach.
2-5 Feb. 1920: Saw a pair of eagles around a newly lined nest near Camp Banning. He stated that this nest had been in use since at least 1908.
16 Feb. 1921: Two apparently active nests were seen near Camp Banning and about 3 mi. NW of Avalon, respectively. The former was the one seen in the previous year, and the other was located on a huge outcropping ledge of rocks 500 feet above the water. He noted that recreational uses of the island were now pushing the eagles into less accessible sites.
17 Feb. 1921: Saw more eagles.
18 Feb. 1921: Three nests were examined and found to contain new linings, being ready for eggs. The nests were located 4, 6, and 8 miles NW(?) of Avalon, and van Rossem estimated that each pair required about two miles of coastline. A fourth nest was found 3 mi SE of Avalon.
7 April 1922: Found a nest that contained two newly hatched chicks.

If van Rossem's estimate of the linear density of nesting eagles, i.e., a nesting pair every two miles of coastline, then the 75-sq mi Santa Catalina Island must have supported a very large eagle population.

Ross (1925) stated that he saw a bunch of ravens on this island circling a Bald Eagle that was feeding on a goat on a trip to Santa Catalina Island between 6-9 April 1925.

Bent (1937) noted that he and J.R. Pemberton saw an apparently active Bald Eagle nest on Santa Catalina Island on 22 Feb. 1929.

I interviewed Harold Hill by telephone on 8 December 1999, and he provided the following information from his field notes for 1946 on visits he made to Santa Catalina Island with Telford Work:

12 May: Found an apparently active Bald Eagle nest at Seal Rock near the southern tip of Santa Catalina Island. The nest was not investigated on this date.
25 May: Hill and Work returned to the island, and they found another pair of Bald Eagles, including a subadult male on the east side of the island near Torreon Bay. The pair of birds perched 1/4-mile away

from the fresh-looking nest, but an examination of the contents showed that the nest was empty and had not been used that year.

26 May: Hill and Work returned to the Seal Rocks nest and took photos and movies of the single young in the nest. It was not yet old enough to fly.

The movies made on 26 May, and probably on other dates, were recently deposited at the Santa Barbara Museum of Natural History by Dr. Work's widow, Martine.

A Los Angeles Audubon Society (LAAS) party reported a Bald Eagle perched on a rocky crag on Santa Catalina Island on 20 October 1946 (*fide* H. Cogswell 1947a). In the following year, a pair was seen at a nest on LAAS field trips on 8 February and 1 March (*fide* H. Cogswell 1947b). Again, on 29 February 1948, the annual LAAS field trip recorded four eagles, including a pair on a nest on the east end of the island (*fide* H. Cogswell 1948). Only one eagle was seen on the annual spring LAAS trip on 20 March 1949 (*fide* K.E. Stager 1950), but three immature found on 27 August by J.H. Comby (*fide* K.E. Stager 1950) indicate that the species may still have been breeding successfully on Santa Catalina. By 1955, however, none were recorded on the LAAS trips, prompting the regional editor, Arnold Small, to remark that "Bald Eagles remain very scarce in this area and none were seen in the vicinity of Catalina throughout the summer and fall (Small 1955).

Doug Propst, former manager of the Santa Catalina Conservancy, told Jones and Collins (ms) that Bald Eagles survived until about 1953, when a ground squirrel poisoning program eliminated the remaining birds. However, when I had interviewed him earlier (in the late 1970s), he did not mention the poisoning episode and stated at that time that Bald Eagles survived on Santa Catalina Island until the late 1950s. Based on the territorial nature of Bald Eagles, their usual food habits, and the tendency for most poisoned ground squirrels to retreat to their underground burrows to die, it is highly unlikely that a localized poisoning program of this nature could have eliminated the entire island population of eagles.

Santa Cruz: The earliest report of Bald Eagles on Santa Cruz Island was apparently that of Blake (1887) who reported "Perhaps eight or nine individuals seen and three empty nests, on island rocks" during a visit between 4-24 July 1886. Other early observations include those of Streator (1888), who saw the species there on about 17-18 March 1886 and Mailliard (1899), who encountered eagles occasionally during his visit to Santa Cruz Island in April 1898.

A.J. van Rossem (notes) saw three Bald Eagles on Santa Cruz Island on 25 April 1911, and one of them was "lurking" near a huge nest in a pothole 50 feet above the sea. He suspected that the nest held well-grown young by this date. On the same day, A.B. Howell, another member of the party, saw two immature eagles from the previous year, apparently elsewhere on the island. On 28 April van Rossem saw a pair of eagles near the northwest end of the island, and on 2 May he found a nest in a pine tree near the top of the island which contained a single hen-sized young with feathers just breaking through the gray down.

The published account of the same trip (Howell and van Rossem 1911) termed the Bald Eagle "Rather common" on Santa Cruz Island and confirmed that both adults and immature birds from the previous year were seen, as well as the two nests. Howell (1917) suspected that the

birds were persecuted on Santa Cruz by the resident sheepherders.

Wright and Snyder (1913) mentioned seeing a Bald Eagle on a high cliff on Santa Cruz Island on 7 July 1912, much too late in the season for eggs.

M.C. Badger (notes) reported finding two Bald Eagle nests in the pines at Pelican Bay, Santa Cruz Island, that appeared to have been "robbed" (of their eggs). On 8 April of the same year he found an eagle on a nest at Scorpion Harbor and another nest he examined contained one egg and one just-hatched young.

The empty nests found by Badger were probably those visited earlier (9 March) by Robert Canterbury, then a field collector for the Museum of Comparative Oology in Santa Barbara. Canterbury's own field notes indicate that on 20 April of the same year he saw a pair of eagles working on the nest at China Harbor where he had taken a set of eggs earlier. The birds also scolded him near the nest, a noteworthy observation, since it is still widely believed that this species does not lay replacement clutches when eggs or young are lost.

In his notes for 1920, Badger recorded on 7 March that "Sid and Lawrence [Peyton] left for islands. Couldn't go, too much work." His notes for 11 March contained the following entry: "Boys came in from Ids. with 8 sets Bald Eagle, several sets Pelican." Badger was apparently given three of the sets by the Peytons.

These details were confirmed by an independent party, A.J. van Rossem, who mentioned in his 1920 field notes that all known nests of Bald Eagles were robbed that year by a group of collectors from Ventura [i.e., the Peyton brothers]. Island residents told van Rossem that from seven to nine sets had been taken by the collecting party. He noted that "These people are evidently making a yearly clean-up of eagles on all the northern group of islands, as I have reliable information of seven sets taken last year."

Dawson (1922) confirmed Robert Canterbury took only two sets of Bald Eagle eggs on Santa Cruz Id. in 1919. Later (Dawson 1923), stated that the average date for fresh eggs on the Channel Islands was 1 March.

On 19 August 1922, Loye Miller shot a recently fledged immature eagle on Santa Cruz Island, which was presumably deposited in the UCLA bird collection where Miller was later on the faculty for many years.

Ross (1926) remarked on the apparent scarcity of the species during his visit to Santa Cruz Island between 29 March to 1 April 1926, although his basis for comparison was not clear, since he had probably not visited the island previously.

On 30 March 1927 Dudley R. DeGroot (notes) and his party investigated an eagle's nest on Santa Cruz that contained a young eaglet probably hatched that day and three large fish. This nest was 3-4 mi inland from Smuggler's Harbor and probably represents a nest site not ordinarily, if ever, visited by the Peytons and Badger. They investigated, but did not enter,

another nest at Chinese Cove, and they suspected that it contained young.

On 12 April 1936, a party consisting of M.C. Badger (notes), E.N. Harrison, and L.T. Stevens saw several eagles at Prisoner's Harbor, Santa Cruz Island, but evidently did not seek eggs of the species at this time because of the lateness of the season. In the following year, Badger and Stevens saw an eagle on a nest at Potato Harbor, Santa Cruz Island, on 7 March (M.C. Badger notes).

Jones and Collins (ms) alluded to six sightings of Bald Eagles on Santa Cruz Island between 28 August and 12 September 1948 by Frank Pitelka (notes), and they also mentioned another, unattributed record of an adult there on 1 March 1950. Five found on Santa Cruz Island on 1 April 1953 by John Tremontano (*fide* A. Small 1953) represented the largest number of the species reported on any of the Channel Islands in the 1950s. An eagle encountered by Waldo G. Abbott on 18 September 1960 (*fide* A. Small 1961) could have been a migrant.

Peter Howorth (*in litt.*, 13 July 1979) informed me that an adult Bald Eagle was captured on Santa Cruz Island in about the summer of 1959. It later died, possibly from some type of poisoning, and he believed that it had been donated to the Santa Barbara Museum of Natural History. Given the season, this bird was probably a resident individual. In the same letter, Howorth mentioned that an immature eagle was seen later ("within a year or two") on Santa Cruz Island by Warren Sears. The owner of Santa Cruz Island, Dr. Carey Stanton told me in the early 1980s that he thought Bald Eagles disappeared completely from the island by the "late 1950s."

Judging from the notes and egg set data of M.C. Badger and the Peyton brothers, there were at least seven nest locations in use along the Santa Cruz Island shoreline during their egg collecting visits to the island between 1916-1920, and eggs were collected from as many as five of these in a single season. The actual number of nesting pairs on the island was doubtless much larger, however, since there were later references to nests in the interior of the island which the Ventura County collectors did not routinely visit, if ever.

Santa Rosa: On 2 April 1927, Dudley R. DeGroot (notes) found an old destroyed Bald Eagle nest in a grove of Torrey Pines "several miles down from the main ranchhouse" on Santa Rosa Island. On the following day, he located an active nest in the next canyon, and it was also located 25 ft high in a pine tree. It contained an addled egg (apparently punctured by a talon), which he collected, and a young bird about three days old. The nest was said to be 10 ft high by 6 ft in diameter, and it contained a Surf Scoter *(Melanitta perspicillata)*, Common Raven *(Corvus corax)*, the feet of several gulls (*Larus* sp.), and some large sea bass.

According to the notes of J.R. Pemberton, also a member of the party that visited Santa Rosa Island between 2-4 April, they counted 10 eagles and found three nests, two containing small young. All of the nests were in trees, and they were also located well inland from the ocean.

Jones and Diamond (1976) surmised that Bald Eagles survived on Santa Rosa until about 1958, based largely on conversations with Bill Wallace, a longtime resident on the island. More

recently, Jones and Collins (ms) stated that Bald Eagles continued to attempt to breed on the island until about 1958, but that Wallace had told them that the ranch foreman on the island persecuted the birds by shooting adults and capturing chicks from about 1953 to the early 1960s. It is doubtful that these practices, which was apparently opportunistic, could have eliminated the entire resident population, however, given the large size of the island.

Some of the eagle nests on this island were of truly gargantuan size, probably indicating long years of use. Ed N. Harrison (notes) estimated the size of one nest as 14 feet deep in 1934. Peter Howorth and I photographed a long unused eagle nest still surviving in a pine on the SE end of Santa Rosa in 1980 and estimated its depth to be at least 10 feet even after at least 20 years of disuse.

From the available fragmentary information, it is impossible to estimate the size of the historical population of Bald Eagles on Santa Rosa Island because of its large extent and the tendency of the birds to nest in trees, rather than in more obvious sea cliff locations, as was the case on nearby Santa Cruz and San Miguel Islands. None of the few collectors who visited the island covered much of its area in a single season, and apparently none of them searched the cliffs along the shoreline for eagle nests. There is a high likelihood that additional pairs nested there, and Peter Howorth (pers. comm.) has observed at least one old eagle nest in such a situation on Santa Rosa.

For these reasons, the actual size of the historical Santa Rosa Island resident eagle population may be the most poorly known of any of the Channel Islands. In 1998, David Garcelon (pers. comm.) interviewed Bill Wallace, who showed him on a map of the island the locations of eight different eagle nest sites that were formerly occupied at the same time. Even this may not represent the absolute number of pairs formerly resident on this large island, but it does underscore the insufficiency of egg collecting accounts for accurately estimating the size of the former breeding eagle populations on the larger Channel Islands.

Mainland Southern California: It is ironic that the history of nesting Bald Eagles is more poorly known along the mainland coast of California than on the Channel Islands. There is every reason to believe, however, that the species once nested there commonly, but was eliminated by human activity, including direct persecution, perhaps mainly in the early 19th century.

In my earlier paper (Kiff 1980) I listed seven nesting localities for the southern California mainland since 1900. Another earlier nesting site has come to my attention since the publication of that paper: California Fish and Game biologist Ron Jurek (*in litt.*, 24 Apr. 1990) sent me an account of a probable Bald Eagle eyrie at San Pedro, Los Angeles County, on 10 April 1827. The nest was at "Anniversary Rock" (thought to be the same as "Dead Man's Island") at Reservation Point, a 100-ft tall natural rock formation that was removed in 1929 because of the hazard it posed to ships moving into the port. The report was from a narrative of exploration by a Frenchman, Duhaut-Cilly, who called the birds "sea-eagles," the term by which the European congeneric species, White-tailed Sea-eagle *(H. albicilla)* is known. The nest was said by Duhat-Cilly (1929) to contain two young "in the midst of some disgusting remains of fish."

Peregrine Falcon:

Early authorities, including Willett (1912) and Howell (1917), characterized the peregrine as a fairly common permanent resident on the Channel Islands. The last general assessment of the status of the species prior to its extirpation in the Channel Islands and on the adjacent southern California mainland was by Grinnell and Miller (1944), who also characterized it as "fairly common for a hawk...Numbers, save locally, seem to hold fairly constant." By the mid-1950s there were no more nesting peregrines on the islands; thus, the explanation for their disappearance must be found in some pervasive factor that came upon the scene in the decade following the publication of the Grinnell and Miller's monumental study.

As with the Bald Eagle, data for the few peregrine egg sets collected on the Channel Islands are summarized in Table 2.

Anacapa: Willett (1910) found a nest (or more) of this species with nearly full grown young on Anacapa Island on 5 June 1910.

When Burt (1911) was on the north side of Middle Anacapa Island with Sidney Peyton on about 17 March 1911, they encountered a pair of peregrines thought to be nesting, but did not succeed in finding the actual nest. Wright and Snyder (1913) reported seeing a peregrine on Anacapa on 3 July 1912.

Dudley DeGroot (notes) and other members of his party visited Anacapa on 28 March 1927 and flushed a peregrine with a pistol shot from the seaward side of the north end of the island. They also later saw a bird (another individual?) on the landward side. Given the date, it is likely that these birds were nesting.

With Ed N. Harrison, Martin Badger (notes) recorded a sighting of peregrines at the east end of Anacapa Island on 12 April 1936.

Richard Bond (*fide* Carl Thelander *in litt.*) considered three nesting pairs to be usual, based on his visits to that island in the 1930s. His notes indicate that two egg sets were taken from Anacapa in 1935, but I have not succeeded in finding their present location or identifying the collector. Bond and Sumner (ms) recorded a single nesting pair at one site in April 1934 and again on 16 April 1939, and commented in regard to the latter visit that, "They acted as if they had eggs of newly hatched young." Bond found two pairs of peregrines present on Anacapa on 13-18 May 1940, and he mentioned a third pair reported by M.C. Badger.

Jack C. von Bloeker, Jr. (*in litt.*) informed me that he saw a peregrine engaging in apparent nest defense against a feral cat on Anacapa Island on 18 March 1941. Jones and Collins (ms) also mentioned a peregrine sighting (unattributed) on 21 May 1949, probably too late in the spring for a migrant.

I have been unable to locate any reports of bird surveys on Anacapa Island during the 1950s, so the status of peregrines there during this decade is simply undocumented. Banks

(1966) did not find the species on Anacapa Island in 1963 or 1964, and, based only on the available published information, he thought that no more than one pair ever nested on the island. The notes of Bond and Sumner showed, however, that this was not the case, at least in the 1930s.

San Clemente: The earliest record I have found of the peregrine on San Clemente Island is that of Mearns (1907), who recorded it there between 22-29 August 1894 while accompanied by A.W. Anthony.

Grinnell (1897) did not record the peregrine on San Clemente Island during two visits in 1897, but given the size of the island, it is quite possible that he missed birds that were present, especially if females were incubating eggs at the time.

Breninger (1904) saw a pair on San Clemente during February 1903, and he collected the male.

Linton (1908) visited this island in 1907 and saw one pair of peregrines near the northwest coast and another near Mosquito Harbor. He felt that at least one pair nested on the island that year, but did not actually locate a nest site.

A.B. Howell (notes) noted that Donald R. Dickey wounded a female peregrine on San Clemente Island on 27 March 1915 -- at least he "turned it over with a load of dust shot." In his comprehensive published report on Channel Islands birds, Howell (1917) said that his party saw a pair of peregrines repeatedly on San Clemente Island during late March and early April 1915, but did not succeed in locating a suspected nest site.

According to Jones and Collins (ms), George Willett (notes) saw single birds on several occasions between 8 November-10 December 1939, but these could have been wintering individuals.

San Miguel: Streator's (1888) report of the Prairie Falcon *(Falco mexicanus)* on San Miguel Island from a visit there in July 1886 more likely referred to one or more misidentified Peregrine Falcons, perhaps streaked juveniles, which bear some similarity to the former species.

Linton (1908) found peregrines to be common on San Miguel, as did Willett (1910) in mid-June 1910. Wright and Snyder (1913) also saw two birds, perhaps a resident pair, on Prince Island on 12 July 1912, noting that they were "very wild."

Dudley DeGroot (notes) mentioned that O.W. Howard found "Duck Hawks" nesting on the north point of San Miguel Island in around 1905-1907, where Howard had taken a set of three eggs on 5 April 1906. The DeGroot et al. party, which included Howard, visited San Miguel between 31 March to 2 April 1927. They did not see any peregrines until the second day (1 April), when they spotted a pair in the air near a shack on the beach. Subsequently, a member of the party, J.R. Pemberton found the female on an apparent nest in a pothole on the northwest side of the island, but the site could not be reached, even with a rope. Another nest was located on the southwest side of the island on the same day. It was in a large pothole 300 feet down on a huge cliff. Although the female sat tightly as DeGroot roped down to it, he found that the scrape

was empty, apparently just being ready for eggs. The bird flew around the site closely while DeGroot was in it. These details agree with those reported by Pemberton (1928).

Lowell Sumner (ms) saw a single adult, probably a male, over the channel between Prince Island and Bat Rock on 18-19 April 1939. Nest sites are now known at both locations.

San Nicolas: There is little information on peregrines from this little-visited island.

Loye Miller (ms) found two shot peregrines on the beach at San Nicolas on 7 July 1938. Both had their wings cut off. He prepared the remaining material as skeletal specimens, which are now presumably in the UCLA-Dickey Collection. Most likely, these individuals represented a breeding pair, given the mid-summer date.

Rett (1947) saw two peregrines over the north shore, heading southward, on 14 March 1945 on San Nicolas Island.

A biological survey party from UCLA did not encounter peregrines on the island between 9-13 January 1959 (N. Collias notes).

By the time Townsend (1968) conducted a survey of San Nicolas Island birds between 2 May 1962 and 1 January 1964, no peregrines could be found on this island.

Santa Barbara: Cooper (1870b) collected a female peregrine (MVZ 4386) on Santa Barbara Island on 27 May, 1863, as the bird and her mate were evidently engaged in some sort of nest defense against his intrusion. He suspected that the pair was probably feeding young at the time.

As pointed out by Jones and Diamond (1976), it is of interest that Grinnell (1897) apparently did not encounter peregrines on Santa Barbara Island during his visit there between 13-18 May 1897. Had there been a nesting pair, he would doubtless have found them on this small island. Perhaps the species nested on the island only intermittently historically.

On 1 May 1908, Howell flushed a pair of peregrines from a cliff on the seaward side of Santa Barbara Island, and he thought they undoubtedly had young at the time (Howell 1917). The DeGroot-Pemberton party visited Santa Barbara Island on 27 March 1927 and noted that this species (number of birds not given) was seen by all members of the party (DeGroot notes).

In May 1940, Jack C. von Bloeker, Jr. (pers. comm., 1979) saw a pair of peregrines that were nesting on a small rocky formation (probably "Sutil Islet"). Bond and Sumner (ms) had failed to record the species there in the breeding season of 1939, although they acknowledged that "the site which they were reported to have occupied in past years was not carefully investigated."

Later, Sumner (ms) stated that this species was not recorded on Santa Barbara Island during a rabbit destruction program conducted between 1953-57. thus, the peregrine vanished as a breeding species from Santa Barbara Island between 1940 to 1953.

Santa Catalina: In addition to the egg sets taken by Howard in 1905 and Willett in 1904, van Rossem (notes) saw single peregrines on Santa Catalina on 18 and 20 January 1920, the latter bird being near Camp Banning.

In a visit to the island in 1938, Ralph Arnold (field notes) reported that "The ravens were seen chasing the Bald Eagle while the Duck Hawks were seen both being chased by the Ravens and chasing the Bald Eagle."

Santa Cruz: Mailliard (1899) recorded one or more peregrines on Santa Cruz Island during April 1898, but gave no specific details.

On a visit to Santa Cruz Island between 20 November to mid-December 1907, Linton found peregrines to be fairly common along the southern and southwestern coasts, where he thought they undoubtedly nested (Linton 1908).

Both Willett (1912) and Howell (1917) attributed a set of three slightly incubated eggs collected by O.W. Howard on 5 April 1906 to this island, but these specimens were actually taken on San Miguel Island, as mentioned above.

Peregrines were evidently somewhat secretive about the locations of their nests on the islands, judging from the comments of several collectors. For example, Robert Canterbury (notes), an egg collector working for William Leon Dawson at the Museum of Comparative Oology, wrote on 15 April 1919 "I flushed a female Duck Hawk right near this last Raven's nest but could not find the nest. The female bird started in scolding and then the male soon arrived. I sat down to watch and let her go back to the nest, but she would not. I spent about 1 hour looking for the nest."

The same refrain was found in the notes of Martin C. Badger, who made repeated egg collecting forays to Santa Cruz Island. His notes record peregrine sightings on 4 March 1918, 8 April 1919, 12 April 1936 (Scorpion Harbor), and 7 March 1937 (Potato Harbor), but he was never successful in collecting eggs of the species, noting in one entry that "the birds were too wise."

Most visitors (e.g., Howell and van Rossem 1911) who spent most or all of their time on foot on Santa Cruz Island, rather than circling its periphery in a boat, did not encounter Peregrine Falcons. A.J. van Rossem (notes) was on Santa Cruz Island during 19 March to 6 April 1920, and he did not regard this species as common, but noted that birds were occasionally seen about sea and inland cliffs. Another visitor to the island, H.H. Sheldon (notes) recorded a peregrine in flight over the "North Potrero" between 17-29 December 1927.

Richard Bond (notes *fide* C. Thelander) visited Santa Cruz Island in April 1935 and found two pairs of breeding peregrines.

Ed Harrison, who collected eggs on Santa Cruz Island during the 1930s, told me (pers. comm. 1979) that he and Lawrence Stevens knew of a peregrine nest location on Santa Cruz, but

the cliff was so inaccessible that it "would have been like trying to climb Half Dome."

Jack C. von Bloeker, Jr. (pers. comm., 1979) informed me that his biological survey party did not find any peregrines on Santa Cruz Island during December 1943.

According to Jones and Collins (ms), Frank Pitelka (notes) saw a peregrine on this island on 2 and 12 September 1948.

Santa Rosa: A party consisting of Dudley R. DeGroot, J.R. Pemberton, Harry W. Carriger, and O.W. Howard visited Santa Rosa Island between 2-4 April 1927 and found three pairs of peregrines, two of them located far inland in canyons (Pemberton notes). No eggs were collected, and it was thought that the birds had not yet laid. DeGroot (notes) mentioned one pair roosting on a cliff facing the ocean about 3 mi NW of their anchorage at the pier. Four miles further along, the party investigated a canyon containing a large stream, and on the highest and steepest cliff in this canyon, they flushed a pair of peregrines. Investigation of the cliff did not disclose an active nest site, however.

In the following year, a set of three eggs collected by DeGroot and Pemberton on Santa Rosa Island on 22 March 1928 was collected from a cliff in an area known as "Green Canyon," according to Raymond Quigley (pers. comm. 1978).

Discussion

At the time of my 1980 paper I knew of 82 sets of Bald Eagle eggs collected on the Channel Islands. That figure has now grown to 92, although the present whereabouts of some of them are unknown, and further refinement of the data may reveal a few duplications. No previously unrecorded eagle nest sites have come to my attention. With few exceptions, the collecting events were well spaced temporally and geographically, and my earlier conclusion that egg collecting probably had only a temporary deleterious effect on certain local populations still stands. Fifty-six, or more than half (61%), of the sets were taken on Anacapa and Santa Cruz Islands, where the species still nested for more than a decade after the last eggs were collected.

The maximum number of active Bald Eagle nests reported for each island in a single year is shown in Table 3, and the total number (23) for the Channel Islands is the same one reported in my 1980 paper. Overall, active nests were reported from a minimum of 35 different sites on the Channel Islands between 1875-1949, but there are many reasons to believe that the actual number of breeding pairs was much higher than the specific records indicate, perhaps even twice or more as high for certain islands.

To my knowledge, no systematic survey of the breeding population of Bald Eagles was ever made for the Channel Islands in general, or for any of the larger islands in particular. Egg collectors, the main source of historical information on the species, typically went directly to known nest sites to collect eggs, and data on additional sites where eggs were not collected were

recorded indifferently or not at all. As far as I can determine, many large areas, e.g., the coastline of the largest island, Santa Rosa, were never visited by collectors, or, if so, their observations were not recorded, even in their field notes. For example, Ed N. Harrison, who collected on Santa Cruz Island with Lawrence T. Stevens in the 1930s, told me (pers. comm., 1979) that he and Stevens worked only on the southern portion of the island south of Potato Bay and that they never visited the seaward side of the island. Thus, there was evidently no ornithological coverage at all of one-half or more of this large island from about 1931 onward.

A.J. van Rossem (notes) stated that Bald Eagle nests on the coastline of Santa Catalina Island occurred at intervals of about 2 mi, yet this comment was based on the exploration of only 8 mi of shoreline. Extrapolating this estimate to the periphery of the entire 75-sq mi island would yield a very large number of eagle pairs. Comparing the number of eagle nest structures that survived on San Miguel Island long after the eagles themselves had vanished to the small number and location of egg sets collected there, provides a particularly good example of the deficiencies in the historical record in regard to estimating the size of the former resident Bald Eagle population on the Channel Islands. The same can be said for Santa Rosa Island, where egg collectors visited only three active nests in a single year, yet a resident was aware of at least eight sites that were active simultaneously. San Clemente, another large island, was not surveyed after the 1923, when eggs were taken from three nests in one year from a small portion of the island. San Nicolas Island was scarcely visited at all.

Thus, it is worth emphasizing that the data presented here serve only to document the nesting of Bald Eagles at a particular time and place, but they do not approximate the actual number of breeding pairs on the larger islands historically, which was surely much larger.

There was evidently a great deal of persecution of eagles by sheepherders and others on some islands, but this was by no means universal, and the attitudes of residents varied greatly from island to island and between different periods on the same island. A San Clemente Island resident ("Mr. Howland") told the A.B. Howell, Donald Dickey, and Laurence Huey party in 1915 that he was sure that the eagles did not kill sheep and had only seen a bird carrying a lamb once. Thus, the sheep and lamb skeletons observed earlier in and around nests on that island by C.B. Linton (1908) were probably obtained as carrion. As mentioned above, the San Miguel Island resident, "Mr. Brooks," who sought the destruction of the local eagles, was followed by longtime caretaker, Herbert Lester, whose benign attitude toward the birds probably allowed the resident population to make up for its earlier losses.

While it is not possible to determine the specific year of extinction of Bald Eagles on each island, there is good evidence that the species nested on Santa Catalina, Anacapa, Santa Cruz, and Santa Rosa Islands until at least the 1950s, and probably on San Nicolas Island as well. There are no recorded ornithological observations for San Clemente Island between 1939 and the 1960s, when the species was locally extinct; thus, no conclusion can be drawn about the time of the extirpation of the former eagle population there. There were no eagles on tiny Santa Barbara Island when it was visited two different biological survey parties in 1939, but as the island probably only supported one pair of eagles, intermittent nesting there may have been the norm.

I agree with Jones and Collins (ms) that there is remarkably little mention of peregrines on the Channel Islands in the technical literature or in collector notes, given their apparent abundance on the islands. However, I am unaware that any egg collectors ever visited the Channel Islands, especially Santa Catalina, specifically to collect eggs of this species, although this does appear to have been the case on the Los Coronados Islands, where there was an unusually high density of nesting peregrines. Many of the Channel Islands peregrine nest sites seem to have been particularly difficult to access on steep, crumbling sea cliffs, in contrast to some of the mainland sites, and no doubt represented a major investment of time and energy for collectors who were probably more interested in acquiring seabird eggs that could be found nowhere else in California.

When I embarked upon this report, I was hopeful that the falconry community might be a rich source of additional information on the historical status of peregrines on the Channel Islands. However, it soon became apparent that few known falconers ever visited the islands to obtain peregrines for their sport, and this provided to be an unproductive avenue of inquiry. Dan Fenske (*in litt.* to Carl Thelander, 3 October 1979), who is well acquainted with the California falconry community, related that Dayton O. Hyde took a young peregrine from a nest on Santa Rosa in about 1942 and that to his (Fenske's) knowledge, this was the only bird taken from the Channel Islands for falconry purposes, at least from the 1940s until the extirpation of the species.

Thelander (1977) summarized the notes of Richard Bond, who visited certain Channel Islands several times in the 1930s in search of Peregrine Falcons. These data were included in the totals in his later summary on the status and distribution of the peregrine in the western United States (Bond 1946). Based mainly on some of the reports of peregrines already cited here, in addition to a few observations of his own, Bond thought that there were at least 12 resident pairs of peregrines on the Channel Islands. This is clearly an underestimate, since he overlooked several of the reports cited above. His conclusion that three nesting pairs were the norm on Anacapa Island is of interest, however. It is possible that Bond, who was a falconer himself, may have taken one or more young peregrines on his visits to the islands, e.g., to Anacapa in 1934, 1935, and 1939 (Sumner ms), but I can find no written documentation of this.

The numbers of Peregrine Falcon nests actually documented on the various Channel Islands are shown in Table 4. I have made no attempt to systematically list the latest reports of probable nesting peregrines on the various islands, since the historical record is so deficient it is simply impossible to accurately estimate the number of breeding pairs on all but Santa Barbara and Anacapa Islands. The paucity of information available on the status of peregrines on the Channel Islands after the late 1930s appears to be due to the lack of observers, rather than a lack of birds. In any case, there was no suggestion of a decline in Channel Islands (or California mainland) peregrine numbers at the time of the publication of Grinnell and Miller's summary on California birds in 1944. Thus, I have concluded that the extirpation of this species on the islands must have occurred sometime between the mid-1940s and the early 1960s, when visitors to the islands began commenting on the absence of peregrines.

In my earlier paper I discussed in detail the reasons for regarding the eggshell-thinning effects of DDE as the primary factor leading to the extirpation of Bald Eagles and Peregrine

Falcons on the Channel Islands. All of these points still seem to be valid. They include the correlation between the timing of the introduction of DDT in 1947 and the subsequent extinction of these two species, which occurred in the mid- to late 1950s, i.e., at about the end of the expected lifetime of birds fledged in the 1940s, had there been no additional production of young. In addition, there were simultaneous extinctions on all the islands, including those where human persecution was not occurring, DDE-caused breeding failures of both species throughout most of the rest of their ranges in North America, DDE-caused breeding failures in several species of Channel Islands seabirds, and unusually high local DDE levels in the area.

Acknowledgments

In addition to the many persons who provided me with information used in my earlier paper, I would like to thank Paul Collins of the Santa Barbara Museum of Natural History and H. Lee Jones who generously shared their voluminous manuscript on the birds of the Channel Islands with me, thus bringing to my attention several historical reports of eagles and peregrines that were previously unknown to me. Peter Howorth introduced me to the northern Channel Islands and to his wealth of Channel Islands knowledge. Dave Garcelon has freely shared his Bald Eagle knowledge and his passion for restoring the species to its former abundance on the islands with me for over two decades. RenJ Corado of the Western Foundation of Vertebrate Zoology and Robert McKernan of the San Bernardino County Museum kindly photocopied egg data slips for my use. My present employer, The Peregrine Fund, was patient with my frequent returns, vicarious and actual, to California made in the course of preparing this report.

Literature Cited

Ashworth, C.W., and R. Thompson. 1930. 1930 collecting notes: Ventura County, Calif. Oologist 47:122-123.

Banks, R.C. 1966. Terrestrial vertebrates of Anacapa Island, California. Trans. San Diego Soc. Nat. Hist. 14:173-188.

Bent, A.C. 1937. Life histories of North American birds of prey. Pt. 1. U.S. Nat. Mus. Bull. 167.

Blake, E.W., Jr. 1887. Summer birds of Santa Cruz Island, California. Auk 4:328-330.

Bond, R.M. 1946. The peregrine population of western North America. Condor 48:101-116.

Breninger, G.F. 1904. San Clemente Island and its birds. Auk 21:218-223.

Burt, H.C. 1911. An early spring trip to Anacapa Island. Condor 13:164-167.

Cogswell, H. 1947a. Southern California region. Audubon Field Notes 1:20.

_____. 1947b. Southern California region. Audubon Field Notes 1:143.

_____. 1948. Southern Pacific Coast area. Audubon Field Notes 2:149.

Cooper, J.G. 1870a. Ornithology of California. Vol. 1. Land birds. Edited by S.F. Baird. Geol. Surv. Calif. 592 pp.

_____. 1870b. The fauna of California and its geographical distribution. Proc. Calif. Acad. Sci. 4:61-81.

Dawson, W.L. 1922. The season of 1919. J. Mus. Comp. Oology 2:45-54.

Dawson, W.L. 1923. The birds of California: a complete, scientific and popular account of the 580 species and subspecies found in the state. South Moulton Co., San Diego. 2,121 pp.
Duhaut-Cilly. 1929. (Title unavailable). Translated from the French. Quart. Calif. Hist. Soc. 8(2):166.

Green, E. 1966. A lifetime with the birds: an ornithological logbook. Published by the author. 404 pp.

Grinnell, J. 1897. Report on the birds recorded during a visit to the Islands of Santa Barbara, San Nicolas and San Clemente in the Spring of 1897. Pasadena Acad. Sci. Publ. no. 1. 26 pp.

_____. 1898. Land birds observed in mid-winter on Santa Catalina Island, California. Auk 15:233-236.

Grinnell, J. 1908. Some birds of Anacapa Island. Condor 10:130.

Grinnell, J., and A.H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna 27:1-608.

Howell, A.B. 1917. Birds of the islands off the coast of southern California. Pacific Coast Avifauna no. 12:1-127.

Howell, A.B., and A.J. van Rossem. 1911. Further notes from Santa Cruz Island. Condor 13:208-209.

Jones, H.L., and J.M. Diamond. 1976. Short-time-base studies of turnover in breeding bird populations on the California Channel Islands. Condor 78:526-549.

Linton, C.B. 1908. Notes from San Clemente Island. Condor 10:82-86.

Mailliard, J. 1899. Spring notes on the birds of Santa Cruz Island, Cal., April, 1898. Bull. of

the Cooper Ornithol. Club 1:41-45.

Mearns, E.A. 1907. Mammals of the Mexican boundary of the United States: a descriptive catalogue of the species of mammals occurring in that region; with a general summary of the natural history and a list of trees. U.S. Nat. Mus. Bull. 56. 530 pp.

Pemberton, J.R. 1928. Additions to the known avifauna of the Santa Barbara Islands. Condor 30:144-148.

Peyton, S.B. 1913. A collecting trip to Anacapa Island. Oologist 30:78.

Ramage, M.C. 1946. Northern Division. Condor 48:252.

Rett, E.Z. 1947. A report on the birds of San Nicolas Island. Condor 49:165-168.

Ross, R.C. 1925. Field notes on the raven. Condor 27:172.

_____. 1926. A spring trip to Santa Cruz Island. Condor 28:240-241.

Richardson, C.H., Jr. 1908. Spring notes from Santa Catalina Island. Condor 10:65-68.

Small, A. 1953. Southern Pacific Coast region. Audubon Field Notes 7:290.

_____. 1955. Southern Pacific Coast area. Audubon Field Notes 9:56.

_____. 1960. Southern Pacific Coast region. Audubon Field Notes 15:76.

_____. 1962. Southern Pacific Coast region. Audubon Field Notes 16:447.

Snyder, G.K. 1909. Dusky Warbler haunts. Oologist 26:188.

Stager, K.E. 1949. Southern Pacific Coast region. Audubon Field Notes 3:224.

_____. 1950. Southern Pacific Coast area. Audubon Field Notes 4:35.

Streator, C.P. 1888. Notes on the birds of the Santa Barbara Islands. Ornithologist and Oologist 13:52-54.

Thelander, C. 1977. The breeding status of Peregrine Falcons in California. M.S. thesis, San Jose State University, San Jose, CA.

Townsend, W.C. 1968. Birds observed on San Nicolas Island, California. Condor 70:26-267.

Willett, G. 1910. A summer trip to the northern Santa Barbara Islands. Condor 12:170-174.

_____. 1912. Birds of the Pacific slope of southern California. Pacific Coast Avifauna no. 7:1-122.

_____. 1933. A revised list of the birds of southwestern California. Pacific Coast Avifauna no. 21:1-204.

Wright, H., and G.K. Snyder. 1913. Birds observed in the summer of 1912 among the Santa Barbara Islands. Condor 15:86-92.

Zahn, O. 1895. The Mexican Raven on Catalina Island. Avifauna 1:24-25.

Table 1. Bald Eagle egg sets collected on the California Channel Islands.

CAT. NO.	ISLAND	DATE	NO. EGGS	SET MARK	COLLECTOR	INC. STAGE	SITE
WFVZ 32,392	Anacapa	15 Mar. 1911	2	½	S.B. Peyton, H. Burt, W. Harrison	Infertile	North side of West Island
Badger notes	"	5 Mar. 1916	1		M.C. Badger	Unknown	West Island
"	"	7 Mar. 1916	2		S.B. Peyton, M.C. Badger	Advanced	East Island
"	"	3 Feb. 1917	2		L.G. Peyton	Advanced	
"	"	2 Mar. 1917	2		M.C. Badger, S.B. Peyton	Unknown	West Island
WFVZ 33,980	"	"	2	1-2-17	L.G. Peyton, M.C. Badger	Advanced	East Island
MVZ 2,715	"	4 Mar. 1918	2		M.C. Badger	"	West Island
SMNH	"	"	2	5/2	L.G. Peyton	Unknown	
SMNH	"	9 Mar. 1919	2	5/2	L.G. Peyton	Unknown	
UWBM 27,071	"	7 Mar. 1920	1		S.B. Peyton	"	
Badger notes	"	"	2		L.G. Peyton	"	
SMNH	"	"	2	5/2	"	Advanced	
WFVZ 79,958	"	13 Mar. 1927	2	½-27	M.C. Badger	Advanced	West Island
WFVZ 52,459	"	11 Mar. 1928	1	1/1	R. Thompson	Begun	West Island
MVZ 4,622	"	24 Feb. 1929	2		R. Thompson, C. Ashworth	Unknown	

WFVZ 76,454	"	9 Mar. 1930	3	1-3	C. Ashworth	One-half	West Island
WFVZ 4,212	"	10 Mar. 1935	2	1175	E.N. Harrison	Started	Northwest end of West Island
SBMNH	"	"	2		L.T. Stevens	One-half	On prominent pt. of ridge
WFVZ 4,124	"	1 Mar. 1936	2	1323	E.N. Harrison	Fresh	East Island
MVZ 188	San Clemente	1 Apr. 1897	1		J. Grinnell	Nearly hatched	
FMNH 15,785	"	16 Feb. 1903	2	3/2B	G.F. Breninger	Unknown	
FMNH 481	"	18 Feb. 1903	2	2/2	"	Slight	
WFVZ 23,180	"	3 Mar. 1905	2	1/3	O.W. Howard	Slight	
WFVZ 23,180	"	"	3		"	"	
MVZ 8,676	"	15 Feb. 1907	2	396	C.B. Linton	One-half	
?	"	15 Mar. 1907	2		"	Fresh	
WFVZ 81,995	"	13 Mar. 1915	3	Started	I.D. Nokes	Started	North side of island
WFVZ 63,781	"	4 Apr. 1915	2	C34	D.R. Dickey	Heavy (deserted)	Rocky draw near "Eagle Ranch"
CAS 922	"	1918	1		P. Graham	Fresh	
?	"	8 Mar. 1922	2		N.K. Carpenter, G. Bancroft, Jr.	One-half	
WFVZ 52,453	"	9 Mar. 1922	1	1502	G. Bancroft, Jr.	Almost hatched	

WFVZ 52,454	"	23 Feb. 1923	2	3002	G. Bancroft, Jr.	Well underway	Northwest side of island
WFVZ 52,452	"	23 Feb. 1923	2	3001	G. Bancroft, Sr.	Well underway	Northwest side of island
WFVZ 10,084	"	24 Feb. 1923	3	3003	G. Bancroft, Jr.	Bloody	South side of island
WFVZ 9,883	"	26 Feb. 1923	2		G. Burnham, G. Bancroft, Sr.	Advanced	
BMNH	San Miguel	8 Mar. 1920	1		S.B. Peyton (or Badger?)	Unknown	
WFVZ 52,456	"	1 Apr. 1927	2	2023/2	J.R. Pemberton	Nearly complete	Southwest side of island
Jones & Collins (ms)	San Nicolas	15 Apr. 1909	?	?	C.B. Linton?	Unknown	
FMNH 2989	Santa Barbara	4 Apr. 1906	2	½/-06K	C.K. Knickerbocker	"	
FMNH 2983	"	6 Apr. 1906	2	2/2-06K	"	"	
MVZ 4255	Santa Catalina	16 Mar. 1893	2	188/2	F. Stephens	Commenced	Avalon
WFVZ 23,181	"	3 Mar. 1905	2	½	G. Willett	One-fourth	
WFVZ 6,459	"	9 Mar. 1905	2		"	Fresh	
WFVZ 3,223	"	29 Mar. 1909	2	½	H. Wright	Begun	Torqua Springs
WFVZ 80,479	"	4 Apr. 1912	1	1/1	G.K. Snyder	Addled	"
WFVZ 65,874	"	14 Mar. 1915	1	z2	"Mr. Howard," for I.D. Nokes	Well along	North side of island
SBCM?	"	21 Feb. 1925	2		C. & P. Field	Fresh	

WFVZ 3,224	"	22 Feb. 1929	2	2121/2	J.R. Pemberton, A.C. Bent, and A.J. van Rossem	"	West end of island
WFVZ 81,994	"	12 Mar. 1932	2	x137	I.D. Nokes	Started	West end of island
WFVZ 81,721	"	6 Mar. 1939	2		J. Baumgardt	Showing blood	
BMNH	Santa Cruz	1875	1		H.W. Henshaw	Unknown	
WFVZ 97,197	"	6 Mar. 1916	2	½ (309)	M. Badger	Begun	San Pedro Point
?	"	"	2		"	Unknown	Pelican Bay
CMNH 1,682	"	"	1		S.B. Peyton, M.C. Badger	"	Prisoner's Harbor
WFVZ 81,996	"	7 Mar. 1916	2	3-2-16	S.B. Peyton	Advanced	
SBCM	"	2 Mar. 1917	2		"	Fresh	San Pedro Point
WFVZ 33,979	"	"	2		"	Advanced (1 addled)	Middle Grounds
Badger notes	"	"	2		"	Unknown	Valley Anchorage
"	"	"	2		"	"	Blue Banks
WFVZ 81,997	"	3 Mar. 1917	3	1-3-17	S. Peyton, M.C. Badger	Fresh	Potato Harbor
MVZ 7,778	"	4 Mar. 1918	2		M. Badger	10 days	Middle Grounds
Badger notes	"	"	2		"	Unknown	Potato Harbor
"	"				"	"	San Pedro Point
"	"				"	"	Valley Anchorage

SBMNH	"	20 Mar. 1919	2	R1/2-19	R. Canterbury	1 hard set, 1 infertile	China Harbor
SBMNH	"	27 Mar. 1919	2	R4/1-19	"	Hard set	
Univ. Wash?	"	7 Mar. 1920	2		L. Peyton	Advanced (1 addled)	
WFVZ 17,468	"	"	2	2-2-20	"	1 advanced, 1 addled	
?	"	11 Mar. 1920	?		Peytons	Unknown	
DMNH	"	"	2	6/2	"	Advanced	China Bay
SBMNH	"	6 Mar. 1922	2	2/2-22	W.L. Dawson	Unknown	
?	"	9 Mar. 1922	2	R10 2/22	R. Canterbury	"	
WFVZ 3,227	"	11 Mar. 1928	1	2061/1	J.R. Pemberton	One-third	North side of island
WFVZ 65,872	"	9 Mar. 1930	2	3/2	C. Ashworth, R. Thompson	One-fourth	Potato Bay
?	"	8 Mar. 1931	?		C. Ashworth	Unknown	
WFVZ 126,211	"	"	1	2/1	R.E. Thompson	Advanced	
Peyton (1931)	"	"	1		S.B. Peyton	Unknown	
"	"	"	2		"	"	
"	"	"	3		"	"	
?	"	5 Apr. 1931	1		L.T. Stevens	Fresh	
SBMNH	"	9 Mar. 1935	2		"	One-fourth	Potato Bay
"	"	"	2		:	"	China Harbor
WFVZ 4,211	"	10 Mar. 1935	3	1174	E.N. Harrison	Advanced	
WFVZ 4,213	"	29 Feb. 1936	2	1322	"	Started	
SBCM	"	"	2		L.T. Stevens	12 days	

WFVZ 1,685	"	11 Mar. 1939	2		E.N. Harrison	Large embryos	SE end of island
WFVZ 79,957	"	"	2	520	L.T. Stevens	Three-fourths	Potato Bay
WFVZ 58,268	Santa Rosa	2 Apr. 1927	1	262	D.R. DeGroot	Addled (1 young also)	West end
WFVZ 3,226	"	10 Mar. 1928	2	2060/2	J.R. Pemberton	1 week	North shore
WFVZ 4210	"	12 Mar. 1934	2	931	E.N. Harrison	Advanced	
WFVZ 22,561	"	3 Mar. 1939	2	1-2-39	L.R. Howsley	Fresh	
WFVZ 22,562	"	5 Mar. 1949	2	1-2-49	"	Advanced	

Museum codes:

BMNH = British Museum of Natural History, Tring, Hertfordshire, UK
DMNH = Delaware Museum of Natural History, Greenville, DE
CAS = California Academy of Sciences, San Francisco, CA
CMNH = Cleveland Museum of Natural History, Cleveland, OH (now at Carnegie?)
FMNH = Field Museum of Natural History, Chicago, IL
MVZ = Museum of Vertebrate Zoology, University of California, Berkeley, CA
SBMNH = Santa Barbara Museum of Natural History, Santa Barbara, CA
SBCM = San Bernardino County Museum, Redlands, CA
SMNH = Slater Museum of Natural History, University of Puget Sound, Tacoma, WA
UWBM = University of Washington Burke Museum, Seattle, WA
WFVZ = Western Foundation of Vertebrate Zoology, Camarillo, CA

Table 3. Number of documented nest sites and approximate extinction dates for Bald Eagles on the California Channel Islands.

ISLAND	MAXIMUM NO. OF DOCUMENTED PAIRS IN A SINGLE YEAR	TOTAL NUMBER OF REPORTED NEST SITES (ALL YEARS)	APPROX. EXTINCTION DATE
Anacapa	3	3	> 1952
San Clemente	3	5	Insufficient data
San Miguel*	3	6	"
San Nicolas	1	1	> 1949
Santa Barbara	1?	1	Insufficient data
Santa Catalina	4	4	1958-59
Santa Cruz	5	7	1958-60
Santa Rosa	3	8	1958
TOTAL:	**23**	**35**	

* - Including Prince Island

Table 2. Peregrine Falcon egg sets collected on the Channel Islands. (See legend for Table 1 for museum codes).

CAT. NO.	ISLAND	DATE	NO. EGGS	SET MARK	COLLECTOR	INCUBATION	SITE
WFVZ 23,185	Santa Catalina	8 Apr. 1904	4		G. Willett	1/4	Long Point
WFVZ 63,151	"	4 May 1905	3		O.W. Howard	Commenced	
?	San Miguel	5 Apr. 1906	3		O.W. Howard	Slight	
WFVZ 58,685	Santa Rosa	22 Apr. 1928	3		J.R. Pemberton, D.R. DeGroot	?	Green Canyon

Table 4. Maximum number of documented pairs of Peregrine Falcons on the California Channel Islands in a single year per island.

ISLAND	MAXIMUM NUMBER OF DOCUMENTED PAIRS
Anacapa	3
San Clemente	1-2
San Miguel	2
San Nicolas	1?
Santa Barbara	1
Santa Catalina	2
Santa Cruz	2
Santa Rosa	3
TOTAL:	15-16

Appendix 1. Present location of collector field notes and unpublished manuscripts mentioned in text.

Carl Thelander:
Richard Bond (notes)

Museum of Vertebrate Zoology, University of California, Berkeley, CA:
Joseph Dixon (notes)
Frank Pitelka (notes)

Smithsonian Institution, Division of Ornithology:
Edgar A. Mearns (notes)

Western Foundation of Vertebrate Zoology, Camarillo, California:
Ralph Arnold (notes)
Martin C. Badger (notes and ms)
Robert Canterbury (notes)
Dudley R. DeGroot (notes)
Ed N. Harrison (notes)
Loye Miller (ms)
J.R. Pemberton (notes)
Sidney B. Peyton (notes)
H.H. Sheldon (notes
Lowell Sumner and Richard Bond (ms)
Adrian J. van Rossem (notes)